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Kim

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(54) **CABLE CONNECTOR DEVICE**

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H01R 11/30	(2006.01)
H01R 13/24	(2006.01)
H01R 13/62	(2006.01)
H01R 13/64	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 11/30*** (2013.01); ***H01R 13/24*** (2013.01); ***H01R 13/6205*** (2013.01); ***H01R 13/64*** (2013.01)

(58) **Field of Classification Search**

USPC 439/39

See application file for complete search history.

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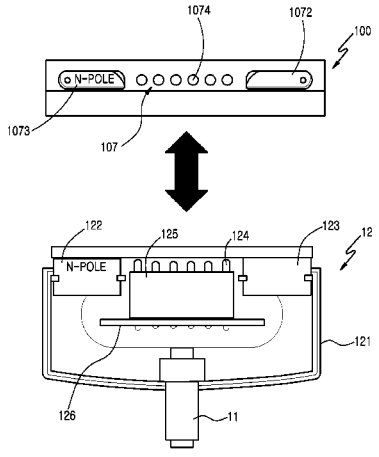
(57) **ABSTRACT**

A cable connector device for an electronic device is provided. The electronic device includes a connector port disposed in the electronic device, one or more magnet coupling parts, each of the one or more magnet coupling parts which is disposed around the connector port, a cable connector device removably coupled to the connector port, and one or more magnet coupling bodies, each of the one or more magnet coupling bodies which is installed in the cable connector device and has the same polarity as that of each of the one or more magnet coupling parts, wherein each of the one or more magnet coupling parts and each of one or more magnet coupling bodies are disposed in positions where they are pushed by repulsive force when the cable connector device is mounted in a reverse direction.

20 Claims, 7 Drawing Sheets



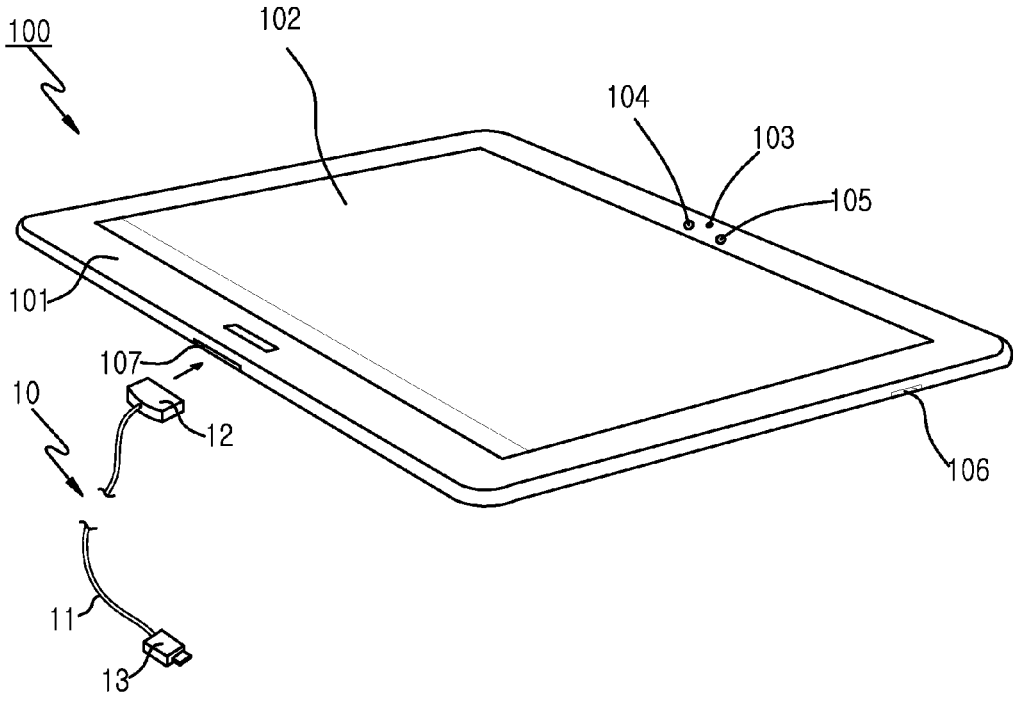


FIG.1

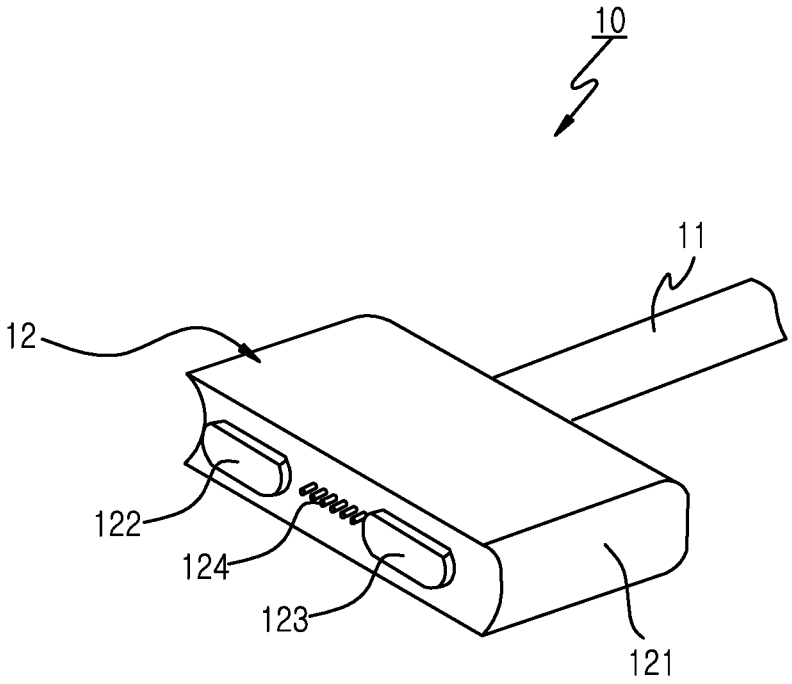


FIG.2

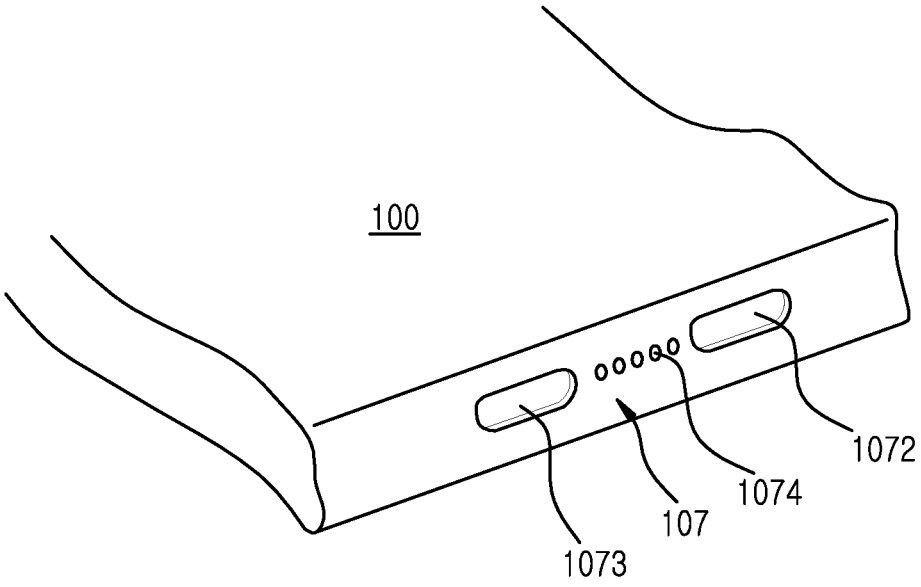


FIG.3

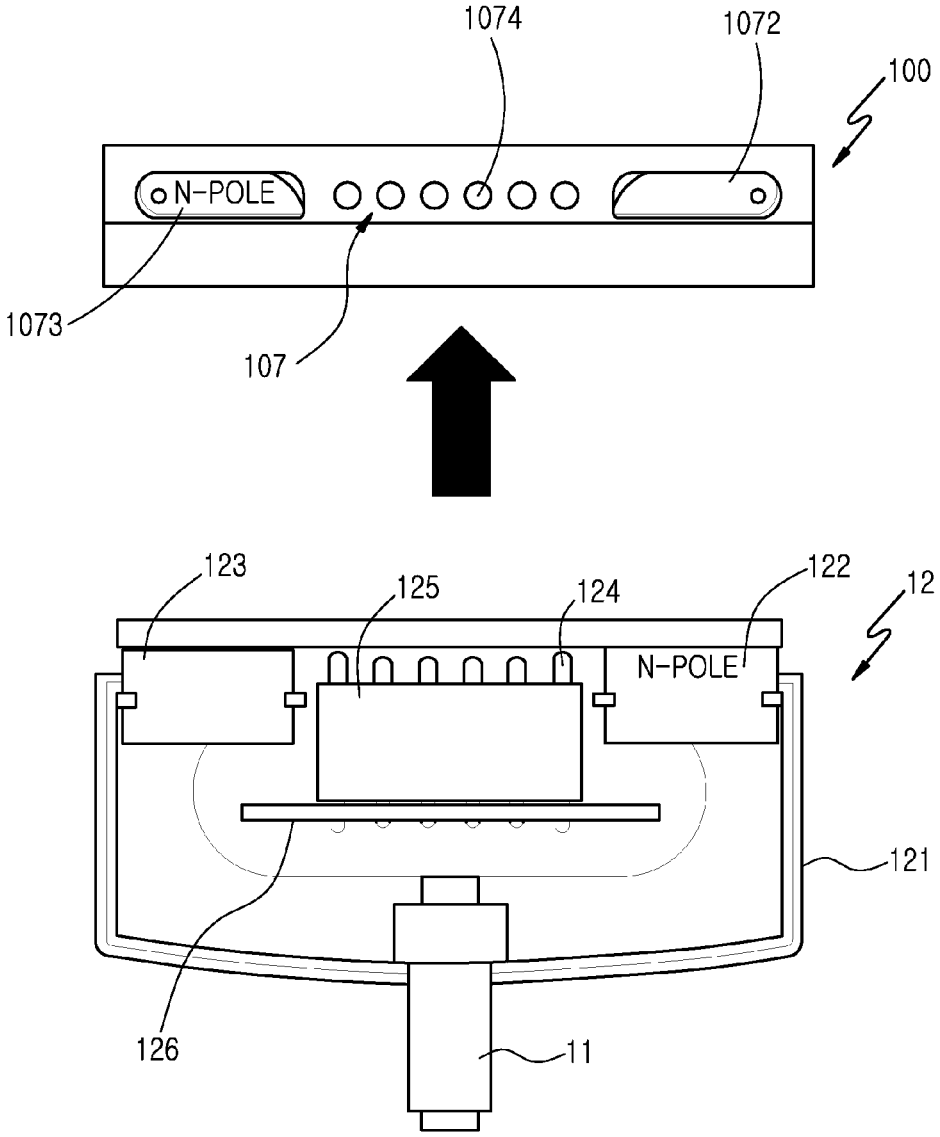
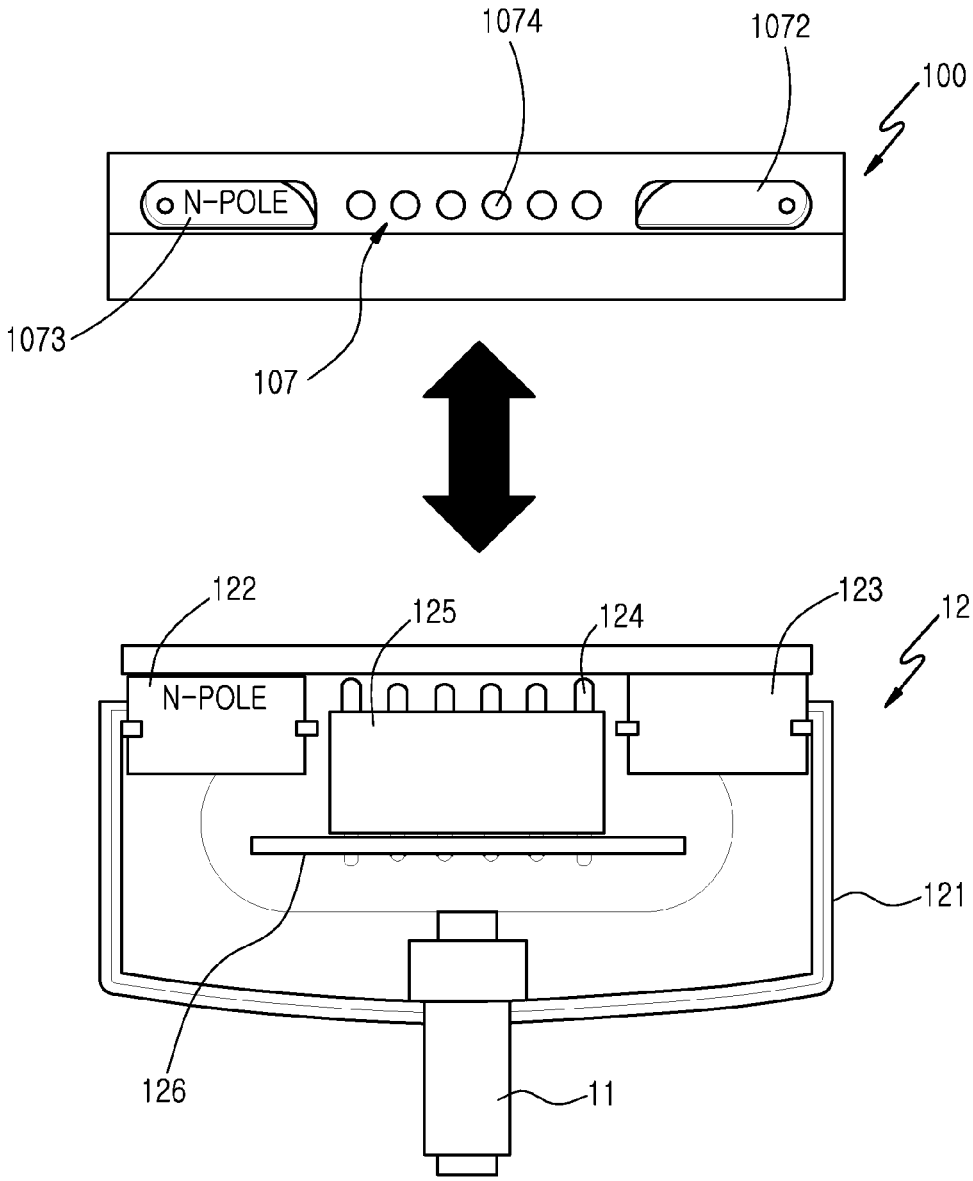

1074
1072
100
N-POLE
1073
107
123
125
124
122
12
N-POLE
121
126
11

FIG.4


1074
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1073
107
122
125
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123
12
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121
126
11

FIG.5

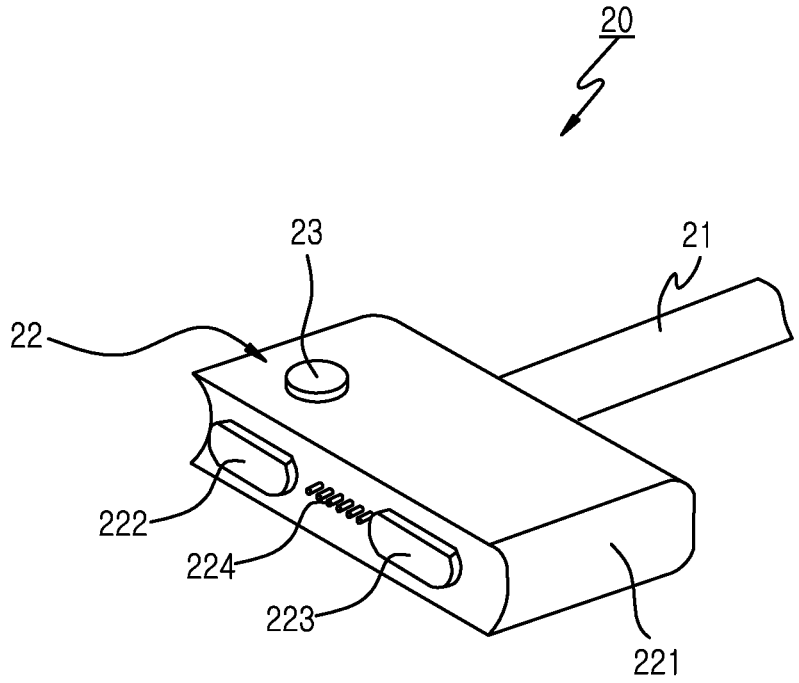

FIG.6

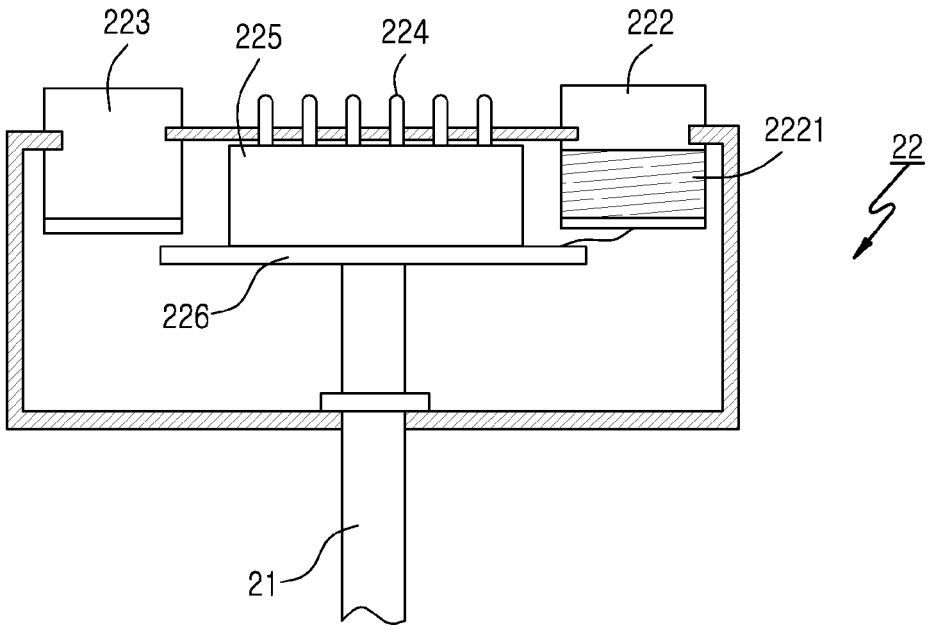

FIG.7

CABLE CONNECTOR DEVICE

CLAIM OF PRIORITY

This application claims the benefit of priority under 35 U.S.C. §119(a) of a Korean patent application filed in the Korean Intellectual Property Office on Nov. 26, 2012 and assigned Serial No. 10-2012-0134484, the entire disclosure of which is hereby incorporated by reference.

BACKGROUND

1. Technical Field

The present disclosure relates to a cable connector device for an electronic device.

2. Description of the Related Art

Recently, as electronic devices have been developed, they have been adapted to cover a variety of fields which are at the heart of modern lives. These electronic devices have been produced in various sizes according to their functions and preference of users. Manufacturers of the electronic devices are concerned about aesthetics as well as functions and slimness of their electronic devices. Although the electronic devices of the manufacturers have the same function as those of other manufacturers generally, electronic devices having more beautiful design are a more preferred by users.

The above-described electronic devices are on a trend of being changed toward maximizing portability. For this reason, it is important to manufacture a cable connector device which charges a battery pack mounted on or in the electronic device or interwork with an external device (e.g., a Personal Computer, etc.) and transmits and receives data.

In general, this cable connector device is formed as a corresponding shape to be inserted into a connector port of the electronic device. For example, there are cable connector devices of various connection types, such as a 5-pin micro cable connector, a 10-pin cable connector, and a 24-pin cable connector.

A connector port in which insertion grooves are commonly formed is installed in a conventional electronic device such that it is mounted on a board of the conventional electronic device and a part of it is exposed to the outside. The cable connector device often connects to the conventional electronic device electrically, and charges the battery pack and/or transmits and receives data by inserting a connector installed at its one end into this insertion groove.

However, the cable connector device inserted into the conventional electronic device is not easily connected to the conventional electronic device which is gradually miniaturized and is thin and light. A connector connection portion of the cable connector device is damaged by certain impact from the outside or the connector port of the conventional electronic device is damaged by severe impact from the outside. Accordingly, because the damaged components must be replaced, they impose an economic burden on the user.

SUMMARY

An aspect of the present disclosure is to solve at least the above-mentioned problems and/or disadvantages and to provide at least the advantages described below.

Accordingly, an aspect of the present invention is to provide a cable connector device to be implemented to prevent reverse insertion.

Another aspect is to provide a cable connector device to be implemented to have the same insertion structure without changing a mechanical exterior appearance and prevent reverse insertion.

Another aspect is to provide a cable connector device to be implemented to prevent accidents by selectively removing magnetic force and preventing a short circuit by external metal materials.

In accordance with an aspect of the present disclosure, an electronic device is provided. The electronic device includes a connector port, one or more magnet coupling parts each having the same polarity, a cable connector device configured to be removably coupled to the connector port and having and one or more magnet coupling bodies, each of the one or more magnet coupling bodies which is installed in the cable connector device and has the same polarity as that of each of the one or more magnet coupling parts, wherein each of the one or more magnet coupling parts and each of one or more magnet coupling bodies are positioned such that they are pushed by repulsive force when the cable connector device is mounted in the connector port in a reverse configuration.

In accordance with another aspect, a cable connector device is provided. The cable connector device includes a cable having a length, an external device coupling connector located at one end of the cable and configured to be coupled to an external device, and a pogo connector located at the other end of the cable and configured to be coupled to an electronic device, and one or more magnet coupling bodies, each of the one or more magnet coupling bodies which is disposed around the pogo connector, wherein each of the one or more magnet coupling bodies is disposed in a position where it is capable of being repulsed by a corresponding magnet coupling part of the same polarity which is disposed in the electronic device when the cable connector device is mounted in a reverse direction.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features and advantages of certain exemplary embodiments of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a perspective view of an electronic device to which a cable connector device is applied according to one embodiment of the present invention;

FIG. **2** is a perspective view of an important portion of an electronic device of FIG. **1** according to one embodiment of the present invention;

FIG. **3** is a perspective view of an important portion showing a connector port portion of an electronic device of FIG. **1** according to one embodiment of the present invention;

FIG. **4** and FIG. **5** illustrate a process of coupling a cable connector device of FIG. **1** to an electronic device according to one embodiment of the present invention;

FIG. **6** is a perspective view of an important portion of a cable connector device according to another embodiment of the present invention; and

FIG. **7** illustrates an internal structure of a cable connector device of FIG. **6** according to another embodiment of the present invention.

DETAILED DESCRIPTION

Exemplary embodiments of the present invention will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

In describing one embodiment of the present invention, a mobile terminal will be shown as an electronic device. A

description will be given for a cable connector device which is applied to, but is not limited to this mobile terminal Accordingly, the cable connector may be applied to or utilized with various devices such as a portable electronic device, a portable terminal, a mobile pad, a media player, a tablet computer, a handheld computer, and a Personal Digital Assistant (PDA). Also, the cable connector device may also be applied to or utilized with various fixed type electronic devices such as a Personal Computer (PC) as well as these portable electronic devices. However, it is to be understood that the present invention is not limited to any one or any group of electronic devices, as the invention is applicable irrespective of the function of the electronic device.

FIG. **1** is a perspective view of an electronic device to which a cable connector device is applied according to one embodiment of the present invention.

FIG. **1** shows a tablet-type mobile terminal as the electronic device.

Referring to FIG. **1**, a display device **102** is installed on a front surface **101** of the electronic device **100**. A microphone device **103** and a plurality of sensors may be installed in an upper portion of the electronic device **100**. The plurality of sensors may be a camera **104**, an illumination sensor **105**, etc. Also, speaker modules **106** can installed at one or both sides of the electronic device **100** to output voices and music when multimedia objects are reproduced.

A connector port to which a cable connector device **10** according to one embodiment of the present invention is applied is typically positioned at a lower side of the electronic device **100**. However, connector port **107** may be positioned at any position of the electronic device **100**.

In accordance with one embodiment of the present invention, the cable connector device **10** includes a cable **11** of a certain length, a connector **12** which is installed at one end of the cable **11** and is electrically connected with the connector port **107** of the electronic device **100** by a contact type, and an external device coupling connector **13** which is installed at the other end of the cable **11** and is connected to a power source and an external device. In a preferred embodiment, the connector **12** is a pogo connector as is known in the art, containing a plurality of pogo pins, such as those available from Everett Charles Technologies of Pomona, Calif. The external device coupling connector **13** may be a Universal Serial Bus (USB) terminal for being electrically connected with a separate adaptor connected to an external power source.

In accordance with one embodiment of the present invention, when the pogo connector **12** contacts with the connector port **107** of the electronic device **100** in a forward direction, if it is adjacent to the connector port **107** of the electronic device **100**, the pogo connector **12** and the connector port **107** are naturally and electrically connected to each other by an attraction force resulting from a magnet installed in the pogo connector **12**. However, if the pogo connector **12** will come in contact with the connector port **107** of the electronic device **100** in a reverse direction, connection of the pogo connector **12** the connector port **107** is hindered or even prevented by a repulsive force of the magnet.

The above-described contents will be described in detail below.

FIG. **2** is a perspective view of an important portion of an electronic device of FIG. **1** according to one embodiment of the present invention.

Referring to FIG. **2**, the pogo connector **12** of the cable connector device **10** includes a body **121**, a plurality of pogo pins **124** which are protruded from the body **121** and are installed at regular intervals, a magnet coupling body **122** of a certain shape which is protruded and installed on one end of the pogo pins **124**, and a metal coupling body **123** of a certain shape which is protruded and installed on the other end of the pogo pins **124**. Preferably, each of the magnet coupling body **122** and metal coupling body **123** are substantially rectangular in shape with rounded off edges, but can be of any shape having horizontal symmetry. Additionally, it is preferred that each of the magnet coupling body and metal coupling body are positioned on opposite sides of the pogo pins.

The magnet coupling body **122** may have any one of an N-pole and an S-pole. The metal coupling body **123** may be formed of pure iron, Special Use Steel (SUS), or any other material which can be influenced by magnetic force of a magnet. Also, it is preferable that the magnet coupling body **122** and the metal coupling body **123** are formed as the same shape.

The pogo pins **124** are typically **6** pins which are protruded and installed at regular intervals. The pogo pins **124** are in a state where it is pressed to the outside or biased outward by an internal elastic body thereof The pogo pins **124** come in contact with terminals **1074** (see, FIG. **3**) located in the connector port **107** of the electronic device while being inserted into the terminals **1074**. Accordingly, although the pogo connector **12** is slightly swung or moved, smooth contact with the terminals **1074** of the connector port **107** may be always maintained by the above-described structure of the pogo pins **124**. These pogo pins **124** may be, for example, a terminal for transmitting and receiving data, a power supply terminal, and a ground terminal In addition, the pogo pins **124** shown in FIG. **2** include, but are not limited to, 6 pins.

As shown in FIGS. **4** and **5**, the pogo pins **124** are located in the pogo connector **12**. The pogo pins **124** are positioned in a pogo pin unit **125** which is mounted on a board **126** which is electrically connected with the cable **11**. A part of the pogo pins **124** protrudes from the body **121** of the pogo connector **12**.

FIG. **3** is a perspective view of a connector port portion of an electronic device of FIG. **1** according to one embodiment of the present invention.

Referring to FIGS. **1** to **3**, terminals **1074** are located in positions corresponding to those of the pogo pins **124** of the pogo connector **12**, in the connector port **107** of the electronic device **100**. These terminals **1074** are exposed to the outside. A metal coupling part **1072** is installed at one end of the terminals **1074** to be attached to the magnet coupling body **122** of the pogo connector **12** by magnetic force of the magnet coupling body **122** of the pogo connector **12**. A magnet coupling part **1073** is installed at the other end of the terminals **1074** to be attached to the metal coupling body **123** of the pogo connector **12**. The metal coupling part **1072** and the magnet coupling part **1073** are formed as the same shape. It is preferable that the metal coupling part **1072** and the magnet coupling part **1073** are formed as a receiving recess shape of a certain depth to receive a part of the magnet coupling body **122** and a part of the metal coupling body **123**, respectively. Because the metal coupling part **1072** and the magnet coupling part **1073** are formed as the same shape, although they are arranged to be exposed to the outside of the electronic device **100**, they may help to implement an aesthetic exterior appearance according to bilateral symmetry.

On the other hand, a magnet of the magnet coupling part **1073** is positioned to have any one of an N-pole and an S-pole. Preferably, the magnet coupling part **1073** is configured to have the same polarity as that of the magnet coupling body **122** installed in the above-described pogo connector **12**.

More preferably, the metal coupling part **1072** and the magnet coupling body **122** are located in a direction where

they contact when the pogo connector **12** is inserted into the connector port **107** of the electronic device **100** in a forward direction. More particularly, the metal coupling part **1072** and the magnet coupling body **122** are disposed such that the magnet coupling body **122** of the pogo connector **12** comes in contact with the metal coupling part **1072** of the connector port **107** and the metal coupling body **123** of the pogo connector **12** comes in contact with the magnet coupling part **1073** of the connector port **107** when the pogo connector **12** is inserted into the connector port **107** of the electronic device **100** in a forward or proper direction. Accordingly, if the pogo connector **12** comes in contact with the connector port **107** in a reverse or "upside down" direction, the magnet coupling body **122** of the pogo connector **12** and the magnet coupling part **1073** of the connector port **107** must be configured to be faced with each other.

FIGS. **4** and **5** illustrate a process of coupling a cable connector device of FIG. **1** to an electronic device according to one embodiment of the present invention.

A description will be given for a process of connecting the cable connector device **10** to the electronic device **100**.

Initially, referring to FIGS. **1** and **4**, if the pogo connector **12** is brought near to the connector port **107** of the electronic device **100** in a forward direction, the magnet coupling body **122** of the pogo connector **12** is faced with the metal coupling part **1072** of the connector port **107**. Simultaneously, the metal coupling body **123** of the pogo connector **12** is faced with the magnet coupling part **1073** of the connector port **107**. That is, because the magnet coupling part **1073** and the magnet coupling body **122** are disposed as a structure in which they are opposite each other, the pogo connector **12** comes in contact with the connector port **107** naturally by providing gravity to the metal coupling body **123** and the metal coupling part **1072** by magnetic force of the magnet coupling part **1073** and the magnet coupling body **122**. Accordingly, the plurality of pogo pins **124** protruded on the pogo connector **12** come in contact with the plurality of terminals **1074** exposed on the connector port **107** to perform a corresponding function.

On the other hand, as shown in FIG. **5**, if the pogo connector **12** is brought near to the connector port **107** of the electronic device **100** in a reverse direction, the magnet coupling body **122** of the pogo connector **12** is faced with the magnet coupling part **1073** of the connector port **107**. Simultaneously, the metal coupling body **123** of the pogo connector **12** is faced with the metal coupling part **1072** of the connector port **107**. That is, the magnet coupling part **1073** is faced each other with the magnet coupling body **122**. Accordingly, repulsive force is generated between the magnet coupling part **1073** and the magnet coupling body **122**, having the same polarity. The pogo connector **12** is prohibited from contacting with the connector port **107** by this repulsive force.

In one embodiment of the present invention, the connector port **107** and the pogo connector **12** have the one magnet coupling part **1073** and the one magnet coupling body **122** in a cross direction, respectively. More particularly, in this embodiment, the metal coupling part **1072** and the metal coupling body **123** are eliminated. For example, in a structure where the pogo connector **12** is inserted into the connector port **107** in the forward direction, a plurality of magnets with different polarity may be alternately installed in the pogo connector **12**. Also, magnets or metal bodies to which gravity is provided may be installed in positions corresponding to those of the plurality of magnets in the connector port **107**. If the plurality of magnets are installed at regular intervals in the connector port **107**, the magnets which have the same polarity as those of the corresponding magnets are installed in the pogo connector **12**. If the pogo connector **12** is inserted into the connector port **107** in the reverse direction, the pogo pins **124** may be prevented from contacting the terminals **107** incorrectly by providing repulsive force to the pogo connector **12** and the connector port **107**.

FIG. **6** is a perspective view of an important portion of a cable connector device according to another embodiment of the present invention. FIG. **7** illustrates an internal structure of a cable connector device of FIG. **6** according to another embodiment of the present invention.

All parts of the connector port in these drawings are substantially the same as those in FIGS. **1** to **5**. Therefore, the same parts are designated by the same reference and a description thereof will thus be omitted.

Referring to FIGS. **6** and **7**, a pogo connector **22** installed at one end of a cable **21** of a cable connector device **20** includes a body **221**, a plurality of pogo pins **224** which are protruded from the body **221** and are installed at regular intervals, an electromagnet coupling body **222** of a certain shape which is protruded and installed on one end of the pogo pins **224**, and a metal coupling body **223** of a certain shape which are protruded and installed on the other end of the pogo pins **224**.

The electromagnet coupling body **222** may have any one of an N-pole and an S-pole when power is supplied thereto. The metal coupling body **223** may be formed of pure iron, SUS, or any material which may be influenced by magnetic force of magnets. Also, it is preferable that the electromagnet coupling body **222** and the metal coupling body **223** are formed as the same shape. More preferably, the electromagnet coupling body **223** should have the same polarity as that of the magnet coupling part **1073** installed in the connector port **107** of the electronic device **100**.

The above-described electromagnet coupling body **222** is preferably electrically connected to a board **226** installed in the body **221** of the pogo connector **22** and includes a coil **2221** which is wound many times on a metal body. This coil **2221** may be determined as an S-pole or an N-pole when power is supplied thereto according to a wound direction of the coil **2221** by Faraday's law.

Also, in accordance with another embodiment of the present invention, a magnetic force removal button **23** is installed in the body **221** of the pogo connector **22**. Accordingly, when the cable connector device **20** is connected to a power source and is not connected to the electronic device **100**, the magnetic force removal button **23** prevents the pogo pin **224** of the pogo connector **22** from being obstructed because peripheral metal materials (e.g., clips, staples, etc.) are attracted to the pogo pins **224**. The magnetic force removal button **23** prevents inconvenience in which a user of the electronic device **100** must remove these metal materials separately.

Also, if the user swings the pogo connector **22** in a state where he or she pushes the magnetic force removal button **23** of the body **221** which is protruded on the body **221**, any metal materials attached by magnetic force may be easily separated because magnetic force is removed. The above-described magnetic force removal button **23** may be any one of, for example, a well-known contact switch for blocking power supplied to the coil **2221**.

The cable connector device according to embodiments of the present invention may prevent the pogo connector from being inserted into the connector port in the reverse direction although the connector port and the pogo connector have the mechanical same insertion structure. The cable connector device may be configured to design the exterior appearance of the electronic device beautifully. The cable connector device may prevent a short circuit phenomenon by external metal materials by selectively removing magnetic force.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. An electronic device comprising:

a connector port disposed in the electronic device, comprising at least one magnet coupling part; and

a cable connector device configured to be removably coupled to the connector port, the cable connector device comprising at least one magnet coupling body,

wherein each of magnet coupling parts and each magnet coupling bodies are positioned such that the magnet coupling parts and the magnet coupling bodies are pushed by repulsive force when the cable connector device is mounted in the connector port in a reverse configuration, thereby inhibiting connector port and the cable connector device to one another.

2. The electronic device of claim **1**, wherein the connector port further comprises:

at least one terminal disposed on the electronic device, wherein a portion of each terminal is exposed; and

at least one metal coupling part, each more metal coupling part positioned in proximity to the terminals and comprising a material capable of being influenced by a magnetic force.

3. The electronic device of claim **2**, wherein the cable connector device comprises:

a cable having a length;

an external device coupling connector installed at one end of the cable and configured to be coupled to an external device;

wherein the magnet coupling bodies are disposed in a pogo connector located at an opposite end of the cable for coupling to the electronic device.

4. The electronic device of claim **3**, wherein the pogo connector comprises:

at least one pogo pin positioned corresponding to that of the one or more terminals in the electronic device; and

at least one metal coupling body installed in a position corresponding to that of each of the magnet coupling parts of the connector port, the metal coupling bodies comprising a material capable of being influenced by a magnetic force.

5. The electronic device of claim **4**, wherein each magnet coupling bodies and the metal coupling bodies are formed as a protruded shape, wherein each of the magnet coupling parts and each more metal coupling parts are formed as a receiving recess shape in which at least the one metal coupling body and each of the one or more magnet coupling bodies are configured to be received, and wherein each of the magnet coupling parts and each of the metal coupling parts are configured to have the same shape.

6. The electronic device of claim **4**, wherein each of magnet coupling parts is disposed at one end of the connector port centering around the one or more terminals, each of the metal coupling parts is disposed at the other end of the connector port centering around the one or more terminals, and each of the magnet coupling parts and each of the metal coupling parts are disposed to have bilateral symmetry.

7. The electronic device of claim **6**, wherein the metal coupling part is disposed at one end of the pogo connector centering around at least the one pogo pin, each of the magnet coupling bodies is disposed at the other end of the pogo connector centering around at least the one pogo pin, and the metal coupling bodies body and magnet coupling bodies are disposed to have bilateral symmetry.

8. The electronic device of claim **1**, wherein the magnet coupling bodies comprise a coil wrapped a plurality of times about a metal body, such that the magnet coupling bodies can function as an electromagnet when power is supplied to the coil.

9. The electronic device of claim **8**, further comprising a magnet force removal button, allocated in a pogo connector of the cable connector device, the magnet force removal button configured to selectively block power supplied to the coil.

10. The electronic device of claim **9**, wherein the power supplied to the coil is blocked only when the magnetic force removal button is pushed.

11. The electronic device of claim **1**, wherein each of magnet coupling parts and each of magnet coupling bodies are magnets having the same polarity.

12. A cable connector device comprising:

a cable having a length;

an external device coupling connector located at one end of the cable configured to be coupled to an external device; and

a pogo connector located at the other end of the cable and is configured to be coupled to an electronic device; and

at least one magnet coupling body, each being disposed around the pogo connector,

wherein each of magnet coupling bodies is located in a position where it is repulsed by a corresponding magnet coupling part of the same polarity which is disposed in the electronic device when the cable connector device is attempted to be mounted in a reverse direction, thereby inhibiting connection of the pogo connector and the electronic device to one another when the cable connector device is attempted to be mounted in the reverse direction.

13. The cable connector device of claim **12**, wherein the pogo connector comprises:

a body;

at least one pogo pin which is protruded and installed on a position corresponding to that of corresponding terminals which are exposed on the electronic device in the body; and

at least one metal coupling body which is installed in a position corresponding to that of the corresponding magnet coupling part of the electronic device when the pogo connector is mounted in a forward direction, the metal coupling body comprising a material which is influenced by magnetic force,

wherein each magnet coupling body is located in a position corresponding to that of a corresponding metal coupling part disposed in the electronic device when the pogo connector is mounted in the forward direction.

14. The cable connector device of claim **13**, wherein each magnet coupling body and each metal coupling body are formed as a protruded shape, wherein the magnet coupling part and the metal coupling part are each formed as a receiving recess shape in which each metal coupling body and each magnet coupling bodies are received, and wherein the magnet coupling part and the metal coupling part are configured to have the same shape.

15. The cable connector device of claim **14**, wherein the magnet coupling part is disposed at one end of a connector port centering around the terminals, the metal coupling part is disposed at the other end of the connector port centering around the terminals, and each of the magnet coupling part and the metal coupling parts are disposed to have bilateral symmetry.

16. The cable connector device of claim 14, wherein the metal coupling bodies are disposed at one end of the pogo connector centering around at least the one pogo pin, each of the one or more magnet coupling bodies is disposed at the other end of the pogo connector centering around at least the one pogo pin, and each metal coupling body and magnet coupling bodies are disposed to have bilateral symmetry.

17. The cable connector device of claim 12, wherein each magnet coupling body is an electromagnet comprising a coil wrapped around a metal body.

18. The cable connector device of claim 17, further comprising a magnet force removal button, located in the pogo connector of the cable connector device, configured to release magnetic force of each magnet coupling body by selectively blocking power supplied to the coil.

19. The cable connector device of claim 18, wherein the power supplied to the coil is blocked only when the magnetic force removal button is pushed.

20. The cable connector device of claim 12, wherein the electronic device is a mobile terminal.

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